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Agenda

- Health Hero Network Background
- Current Technology Solutions
- Contribution to MediKnowledgeMent
 - Information and Knowledge Acquisition → The Feedback Loops
 - Contribution to Innovations
 - Linkage to Other Parts of Project
 - Patient Trials and Expected Outcomes

Health Hero Network Vision

- A better model of care is possible
- Crisis care → Coordinated care
- eHealth Networks and Technologies =
A Powerful Enabler

Health Hero Network

- Founded 1988 in Mountain View, California. Health Hero Network Ltd established 2003 in Dublin, Ireland.
- 25 employees, \$5 million annual sales, serving 30 provider sites and 2500 patients with daily in-home monitoring.
- Solution Partners signed in Ireland, France, Netherlands.
 - Expecting to add Spain, Belgium, Norway in 2003.
- Licensees include Veterans Health Affairs, Mercy Health System, American Medical Alert, TheraSense, Philips.

Blakely, Sokoloff, Taylor & Zafman LLP

(408) 947-8200

Title: Method and System For Integrating Feedback Loops in Medical Knowledge Development and Healthcare Management

1st Named Inventor: Stephen J. Brown

Express Mail No.: EV 439337996 US

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Docket No.: 6858P056

eHealth Demonstration:

Veterans Health Affairs (US)

- Chronic care program using model of care based on eHealth Networks and Technologies from Health Hero Network
- 791 elderly high-risk patients with hypertension, heart failure, COPD, diabetes, enrolled for 1 year, compared to comparison group data
- Results (Disease Management, Volume 5, Number 2, 2002)
 - 63% reduction in hospital admissions
 - 60% reduction in hospital bed days
 - 40% reduction in emergency room visits
 - 64% reduction in nursing home admissions
 - 88% reduction in nursing home bed days
 - Significant improvement in Quality of Life

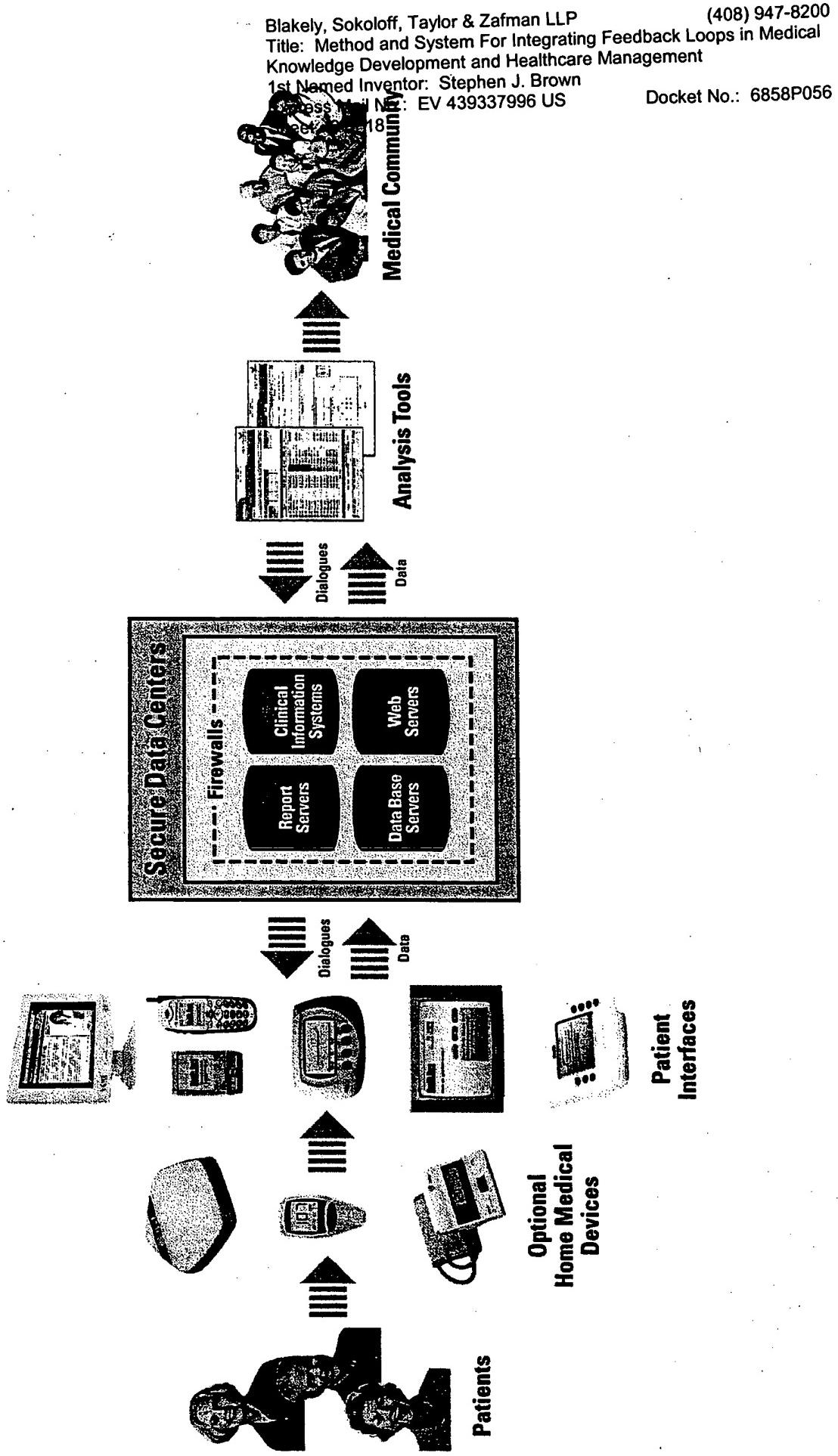
eHealth Demonstration:

Mercy Health System (US)

- Diabetes management program using eHealth Networks and Technologies from Health Hero Network
- 169 low income diabetes patients, one year study period using comparative cohort data from previous calendar year
- Results (Diabetes Technology & Therapeutics Journal, Dec 2002)
 - Outpatient visits reduced 49% ($p < 0.001$)
 - Inpatient admissions reduced 32% ($p < 0.07$)
 - ER encounters reduced 34% ($p < 0.06$)
 - Significant increase in quality of life scores
 - Medication compliance increased from 34% to 94%

Health Hero Network Platform

Vision: Open System for Chronic Care Research and Innovation, Any Device, Any Disease, Many Partners



Decision Support Tools for Caregivers

Vision: Intelligent, Simple, Web-based, Integrated with Existing Clinical Information Systems and Care Processes

Luna. Craig
Fri, April 4, 2003

Health Hero
NETWORK

Find Patient: (Last Name) Contact Health Hero Help Log Out

Home Patient Reports Enrollment Disenrollment Schedule Setup

Work List Profile Results Trends Notes

Use these options to change the work list below.

1. Show patients from which program? 2. For which session date? 3. For which care manager?

All Programs All Care Managers

You are viewing sessions for Nov 19, 2003 in the "All Programs" Program Date:

Responders' Risk Summary

Symptoms	Behavior	Knowledge	General
Medium Risk	2	2	0
High Risk	6	5	4
None	0	0	2

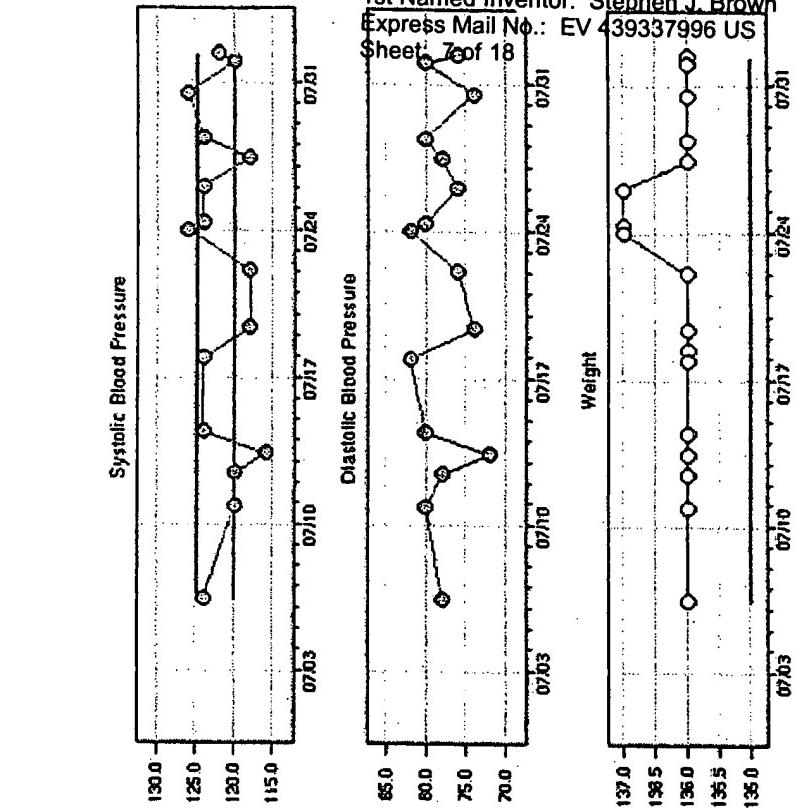
Patient Summary

Responders	Non-Responders
8	4

Create Work List

Responses on Monday, November 19, 2003

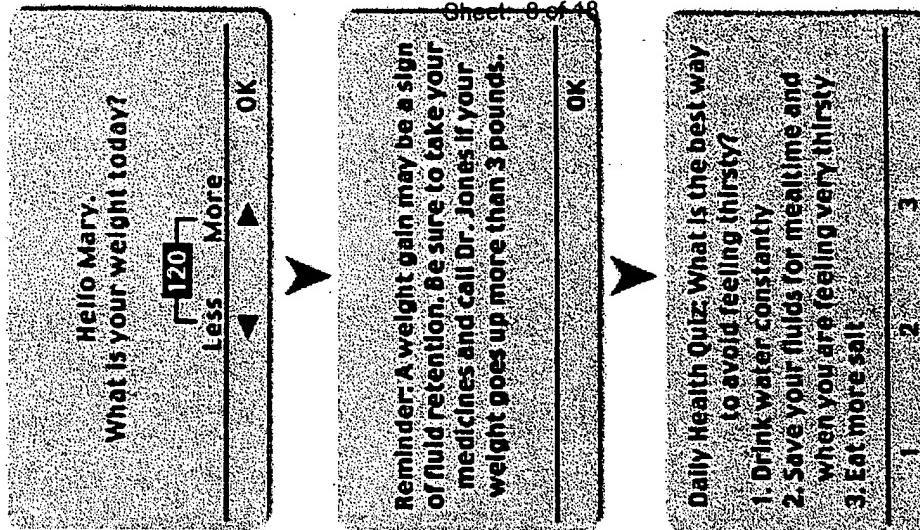
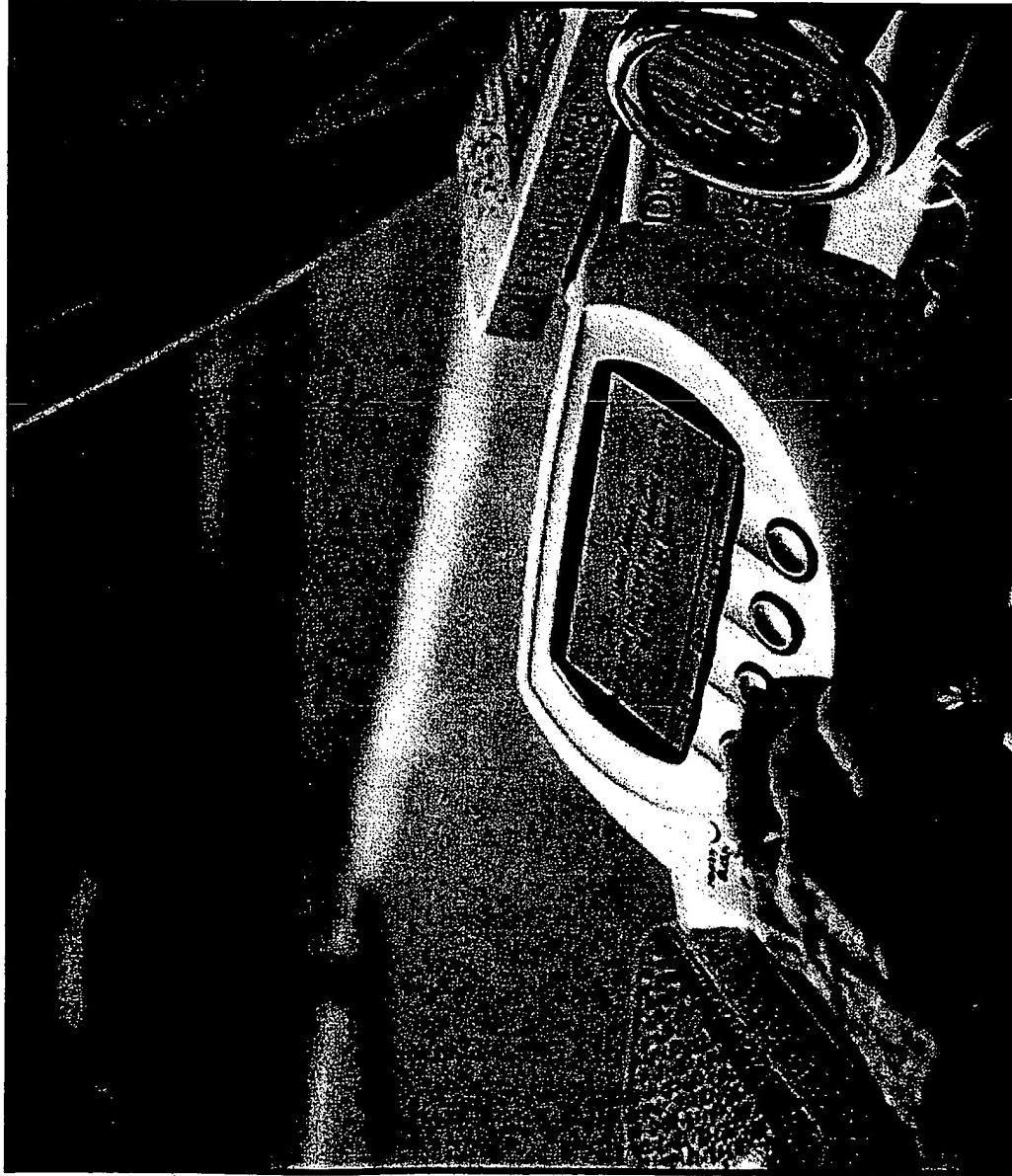
Patient	Response Time	Symp.	Bhv.	Knowdg.	Gen.
Eric Nancy	06:38 AM PST	Low	Low	Low	Low
Cherry, Julia C.	08:41 AM PST	Low	Low	Low	None
Bethinger, Jennifer	11:15 AM PST	Low	Low	Medium	None
Messing, Mel	10:18 PM PST	Low	Low	Medium	None
Lynn, Lynn	09:33 AM PST	Low	Low	Medium	None
Coll, Laurie	10:09 PM PST	Low	Low	Medium	None
Col, John	11:11 AM PST	Low	Low	Low	Low
Man, Maria	08:12 AM PST	Low	Low	Low	None



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Daily Dialogue with the Patient

Vision: Intelligent, Interactive, Personalized, Simple, Integrated with Consumer and Medical Devices



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Patient Dialogue Content

Vision: Based on Latest Medical Knowledge, Individualized, Generating Real-time Information

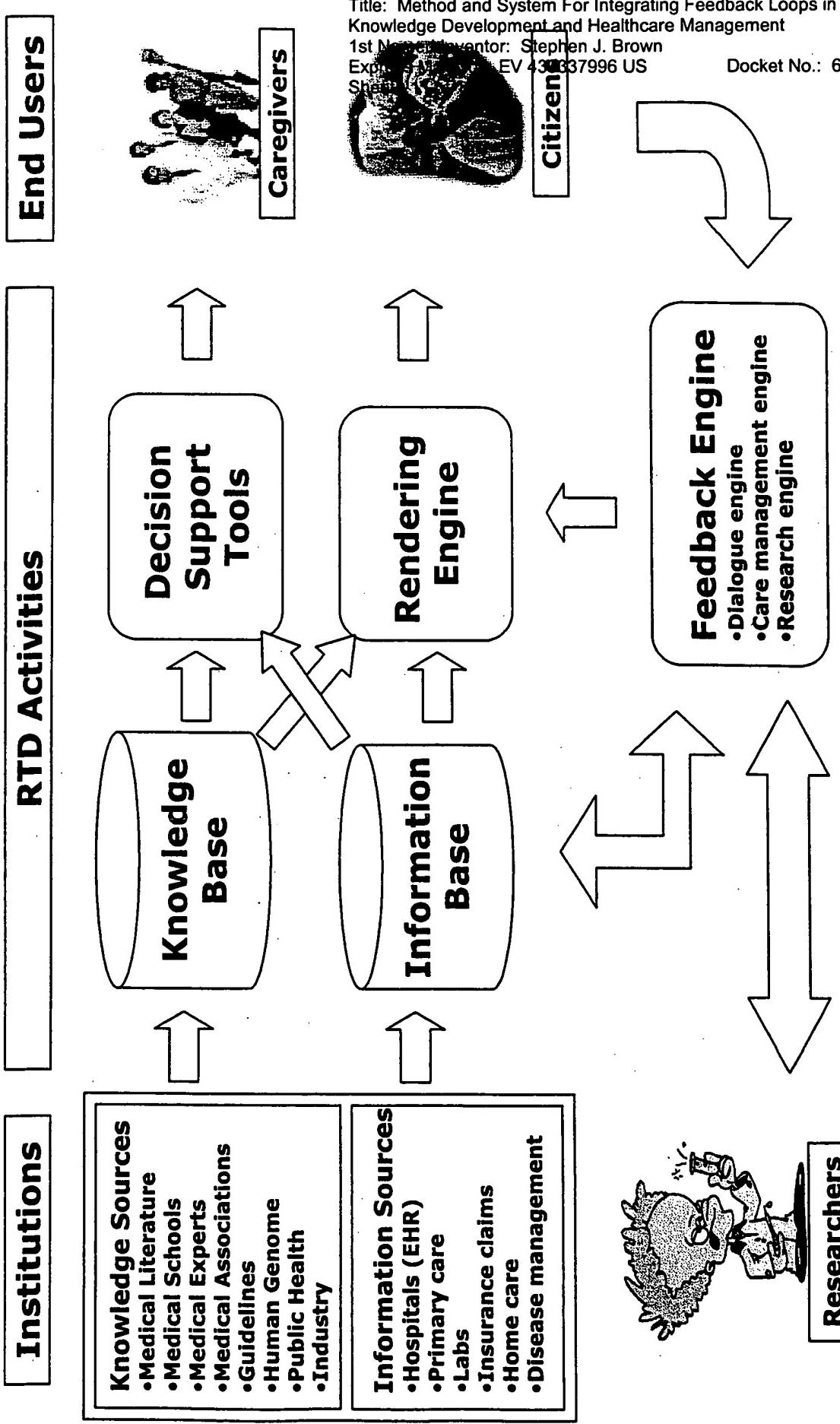
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Demo Library / Demonstration day dialogues	Health Hero NETWORK	Demo Library / Demonstration day dialogues	Health Hero NETWORK
COPD Day	Diabetes Day	CHF Day, 0101	CHF Day, 0101
<p>Legend: O = No Risk G = Low Risk Δ = Medium Risk ■ = High Risk</p> <p>>Welcome back, Pat! Thank you for using the Health Buddy. Begin whenever you are ready.</p> <p>[Greeting 2: None / General]</p> <p>Did you weigh yourself today? [Did you weigh today?: Weight / Behavior]</p> <p><input type="radio"/> Yes</p> <p><input checked="" type="checkbox"/> What is your weight today? [Use the arrows to indicate your weight] [Weight trend: Weight / Symptoms]</p> <p>$\diamond (Q[Weight trend] > M[HighWeight] + 2)$</p> <p><input checked="" type="checkbox"/> This is much higher than your usual weight. Sometimes weight can be affected by heavy clothing or shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Much Higher: Weight / Symptoms]</p> <p><input checked="" type="checkbox"/> Okay</p> <p><input checked="" type="checkbox"/> Remember, If your weight is up 3 or more pounds, call Dr. Welby today at 555-1212.</p> <p>[Reminder: Weight / Symptoms]</p> <p><input checked="" type="checkbox"/> (Q[Weight trend] = (M[HighWeight] + 2))</p> <p><input checked="" type="checkbox"/> True</p> <p><input checked="" type="checkbox"/> This is somewhat higher than your usual weight. Sometimes weight can be affected by heavy clothing and shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Somewhat higher: Weight / Symptoms]</p> <p><input checked="" type="checkbox"/> Okay</p> <p><input checked="" type="checkbox"/> False</p> <p>$\diamond (Q[Weight trend] = (M[HighWeight] + 1))$</p> <p><input checked="" type="checkbox"/> True</p> <p><input checked="" type="checkbox"/> This is slightly higher than your usual weight. Sometimes weight can be affected by heavy clothing and shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Slightly higher: Weight / Symptoms]</p> <p><input checked="" type="checkbox"/> Okay</p>	<p>You may start at any time.</p> <p>Blood sugar trend question:</p> <p>Something to eat for 8 hours or 6 hours]</p> <p>Blood sugar? [Please use the last] [BS Value trend: Blood sugar]</p> <p>od sugar under 70 is considered low, take your medicine, or is low, take your medicine, pills and snacks as by your doctor. [Response: Blood sugar / Symptoms]</p> <p>od sugar between 70-130 is a healthy level. [Response: Blood sugar / Symptoms]</p> <p>od sugar between 131-239 is considered to be moderately high. Take your insulin or diabetes pills or doctor. [Response: Blood sugar / Symptoms]</p> <p>od sugar over 240 is generally too high. Remember to take</p>	<p>You may start at any time.</p> <p>COPD, so that you can take the disease process / Knowledge] s and symptoms: Disease processes</p> <p>3 days? [More S & S: None / report this to your doctor today.</p> <p>our doctor's instructions.</p> <p>Instructions to keep up your health.</p> <p>ction are fever, coughing up phlegm. [Lung infection: Pulmonary /</p> <p>more shortness of breath than acknowledge: Pulmonary /</p> <p>or having more shortness of infection. [Instruct: Pulmonary /</p> <p><input checked="" type="checkbox"/> This is slightly higher than your usual weight. Sometimes weight can be affected by heavy clothing and shoes. Please be sure that you weighed yourself without heavy clothing or shoes. [Slightly higher: Weight / Symptoms]</p> <p><input checked="" type="checkbox"/> Okay</p>	

Health Hero Network Contribution to MedKnowledgeMent

- 1.1 Information and Knowledge Sources and Formats
- 1.2 Information Acquisition → Information Base
- 1.3 Knowledge Acquisition → Knowledge Base
- 1.4 Information and Knowledge Processing → DSTs to identify gaps between Information Base and Knowledge Base (i.e. gaps between what is and what should be)
- 1.5 Information and Knowledge Rendering → Rendering Engine is the interface to end users
- 1.6 Information and Knowledge Acquisition → The Feedback Loops

Project Overview



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Information and Knowledge Acquisition → The Feedback Loops

- Patient Dialogue Engine: Individualized Communication
 - Generated using Information and Knowledge Base
 - Interface with Rendering Engine
 - Feedback to Information Base
- Care Management Engine: Just-in-time Care
 - Generated using Information and Knowledge Base
 - Feedback to DSTs
- Research Engine: Real-time Research
 - Interface to Information Base [extract existing data]
 - Interface to Dialogue Engine [when new data is required]
 - Feedback to Knowledge Base [new discoveries]

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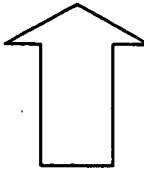
Health Hero Network Contribution to Innovations

Current Status

New Innovations

Patient Dialogue Engine

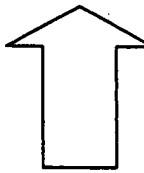
- Pre-packaged, mass customized programs
- Content libraries
- Health Buddy



- Automated individualization
- Content generated by knowledge base rules applied to information base
- Interface to Rendering Engine for any device

Care Management Engine

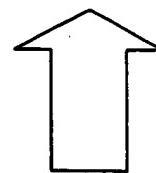
- Risk stratification
- Organizational workflow and efficiency tools
- Manual feedback process



- Intelligent risk tuning and link to DSTs
- Organizational optimization
- Automated feedback loop

Research Engine

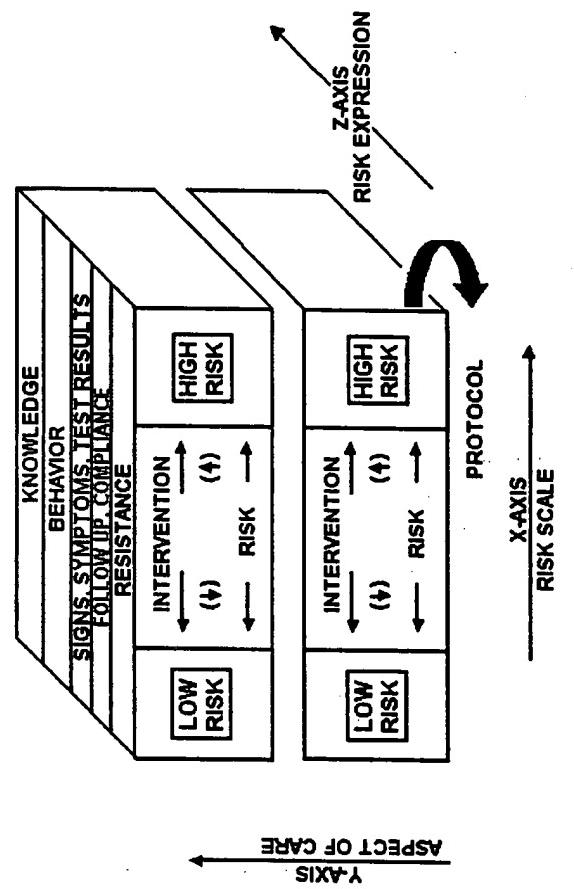
- Data Export to SAS



- Identify subgroups and correlations
- Test hypotheses on living database

Integrating Feedback Loops Within MedKnowledgeMent

- Application Program Interfaces
- Standards for Data Classification
- Ontology for Information and Knowledge Used in Feedback Process



A 3-DIMENSIONAL MODEL OF DISEASE

Feedback Process

Overall goal is apply and generate medical knowledge in a continuous process that leads to lowest achievable risk resulting in:

- Higher quality of life
- Improved clinical outcomes
- Lower cost of care

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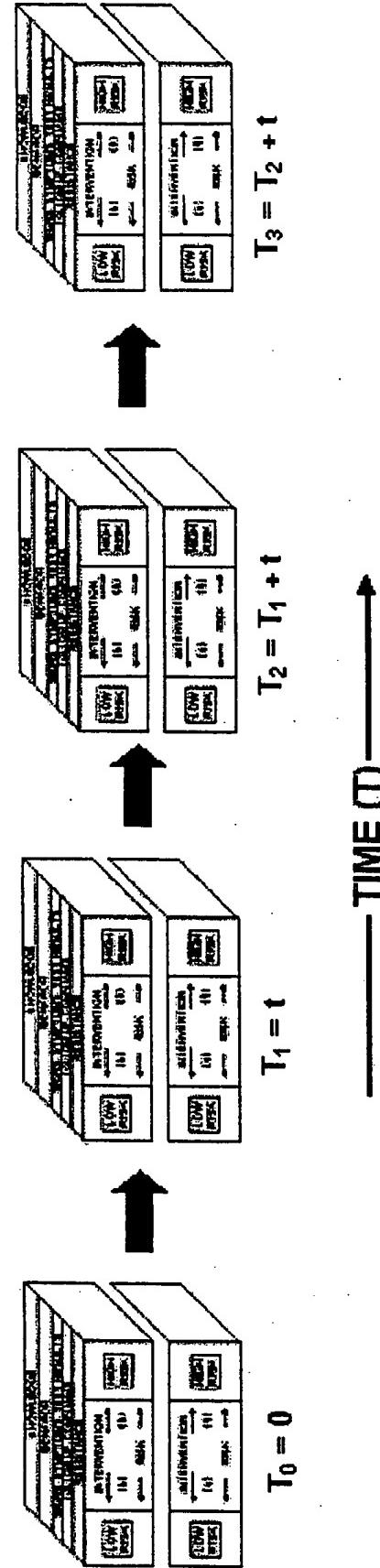
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Patient Trials

- Application to Major Diseases with Great Cost to Society
- Multi-center Demonstration Project
 - Health care and research centers in Europe
 - Large enough for meaningful result
 - Small enough to fit budget
- Standardized Protocol for Data Collection
- Outcomes Analysis
 - Aggregate data analysis for global impact
 - Site specific data analysis by country, disease, and care model
 - Key measures include: acceptability, satisfaction, utilization, clinical impact, medication compliance, quality of life, cost of care
- Medical Review Board
 - Review and approve all site specific study designs

Expected Results

- Reduced emergency department encounters and hospitalizations by detecting patient problems before they become a crisis.
- Improved patient compliance by educating, motivating and monitoring health status and by providing personalized and relevant information.
- Improved safety and quality of care by providing timely and actionable information to healthcare professionals through quality assured processes that can be continuously improved.
- Continuity of care, particularly for the elderly, through integrated, interconnected monitoring and information systems, rather than fragmented, episodic, and crisis driven care.

Expected benefit to the EU

Health is a key IST application for all citizens

- Stimulation of investment in information society technologies to modernize healthcare and enable sustained quality and access.
- Creation of an open platform for the application and generation of Medical Knowledge is an opportunity for European leadership at the convergence of information technologies, medical and consumer devices, and networks.
- Clinical applications that can be deployed as new service offerings over existing and new network infrastructures including broadband and wireless networks will stimulate the growth and success of those networks.
- The emerging eHealth sector will become vital to every region in the world that will experience the demands of an aging population and the resulting need for advanced and sustainable models of care.